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The Journal of Orthopædic Surgery

A SPLINT FOR TREATMENT OF STIFF FINGERS

By Major F. F. A. Ulrich, N. Z. M. C.
Senior Orthopaedic Surgeon, Christ Church Military Hospital, New Zealand.

Doubtless one of the worst bugbears which confronts the Military Orthopaedic Surgeons is stiffness of the metacarpo-phalangeal and inter-phalangeal joints. For this reason I venture to describe a splint which we have found useful in N. Z. Orthopaedic Hospitals.

Various surgeons have written on this subject and a few have described most useful splints for its treatment.

This disability may follow a number of causes which have already been detailed by several writers, especially Mr. Verrall in his excellent article in the June number of The Journal of Orthopaedic Surgery.

Among the various splints which have been used at this hospital, are the Verrall, the Langworthy, the Lewis, the Brockenhurst and so on.

Now in most of these splints with the possible exception of the Lewis splint, the necessary counter-traction is entrusted to the splint encircling the wrist tightly and so abutting against the radial and ulna borders of the hand i. e. the bases of the first and fifth metacarpal bones. Our experience here has been that no matter how tightly these splints are applied there is always some "give" towards the extremity of the limb with the result that there is some loss of dorsi-flexion of the wrist joint and so a distinct loss in our attempt to gain flexion of the finger joints. It was to obviate this that the writer improvised the variety of splint described in this article.

The *Splint,* which for a better name we have called the Finger Flexion Splint, is used solely to gain flexion at the metacarpo-phalangeal and inter-phalangeal joints of patients whose fingers are stiff in an extended or partly extended position and whose wrist joints may be normal or can at least be dorsi-flexed to a useful degree as nearly as possible approximating the position of physiological rest.

So many cases of stiff fingers are associated with stiffness of the wrist joint that in describing this splint it is impossible to dissociate the two conditions as the splint can be used in those cases only which have a useful degree of dorsi-flexion of the wrist joint. This point is essential.

The preparation of the wrist joint is a necessary preliminary. If it will not dorsi-flex it must be forced either by wrenching or operation or both and a reasonable time given for discomfort in the joint to settle down, preferably in Plaster of Paris. It may be necessary to wrench the finger joints at the time of wrenching the wrist joint to gain a little flexion of these joints or a fist plaster may be applied for a very limited time, but this should be avoided if possible and is seldom necessary as almost invariably the dorsi-flexion of the wrist joint at once permits of a limited but working degree of flexion of the fingers, especially the metacarpo-phalangeal joints.

It is taken for granted that all necessary operative procedures on bone, tendon and skin, etc., have been completed.

The Splint is made of 3/16″ mild steel and is fashioned to fit across the palm of the hand opposite the metacarpal necks, curved to retain the arch of the hand as much as possible. It is now bent along the ulna and radial borders of the hand and forearm, passing between the thumb and index finger and kinked forwards at the wrist to follow the contour of the dorsi-flexed wrist joint. The palmar bar of the splint is neatly fitted with rubber tubing but probably any soft tissue would do. The ends of the splint are hooked and terminate about three-fourths of distance up the forearm. Usually a roughened metal strut is welded to the limbs of splint near the hooked ends to facilitate firm incorporation in Plaster of Paris.

The *principle* of the Splint is retention of wrist in a constant degree of dorsi-flexion while flexion of fingers is gained by tape

and glue applied to their dorsal surfaces. The writer first used this method at Alder Hey almost two years ago and has had no reason to relinquish it.

The Splint is retained in position by Plaster of Paris applied to upper part of forearm and elbow—elbow joint being flexed to 90°.

Figure 1 shows the splint in process of application.

Counter-traction is gained by plaster bandage passing firmly from hook to hook of splint over a square of felt placed over back of arm above elbow. The plaster is applied over cotton wool in the orthodox Hammersmith method and is cut away from surface of elbow which patients find useful and which makes splint lighter.

FIG. I.

One-half inch tape is now fixed by Sinclair's glue to dorsal surfaces of fingers, stopping short at metacarpophalangeal knuckles. If tape is slightly cut transversely over center of inter-phalangeal joints flexion is facilitated and reapplication of the tape is deferred.

For the Traction usually the ends of a short loop of strong bandage are glued to the plaster with loop loose over flexor sur-

face, or occasionally a broad loop of the steel (Fig. II) is incorporated in the flexor surface of the plaster.

The plaster may extend almost to the wrist joint or only a limited way down the forearm, depending on necessity or otherwise of electric and other treatment to muscles of forearm.

In some very flexible wrists or in some wrists with limited dorsi-flexion it is sometimes necessary to buckle a strip of webbing across dorsum of wrist from limb to limb of splint as occasionally patient can undo his dorsi-flexion.

Procedure: The plaster and glue having dried for 24 hours flexion of fingers may be commenced by noosing the 4 tapes through the flexion loop as firmly as patient can bear it.

The flexion is divided into two stages:

1. Flexion of metacarpo-phalangeal and first inter-phalangeal joints. This is continued until pads of fingers approximate the thenar and hypothenar eminences (Fig. II).

2. Flexion of first and second inter-phalangeal joints.

FIG. II.

This is gained by passing the tapes between the palmar bar and the palm and applying traction as before. The mild pressure of tapes on base of hand has never caused any inconvenience (Fig. III).

These two stages of flexion of course merge into one another. *Treatment* consists of a daily visit to Physiotherapeutic Department where tapes are united, fingers energised in every way, massage and re-education, and if neecssary graduated faradism applied

FIG. III.

to muscles of forearm and intrinsic muscles of the hand. In most cases patients are also instructed to untie tapes and perform active movements of fingers twice daily.

Tapes are tightened from day to day and when first stage of flexion is attained surgeon must decide whether the splint should be removed and patient return to full treatment in Physiotherapy Department with some mild gymnasium, as graduated grips, or should go on to the second stage of flexion.

In a considerable number of cases it is found that the mechanical part of the treatment outstrips the physiotherapeutic part with

the result that the passive flexion gained is further advanced than the active flexion.

In other cases, especially those where the inactive tissues are specially at fault, a limited degree of extension is lost but this readily returns under treatment in Massage Department, after removal of splint.

Again in a few cases after removal of splint a limited degree of the flexion gained is lost; this is especially so in those cases where our traction treatment has outstripped that of the Physiotherapeutist.

The Splint is usually kept on 1, 2, or 3 weeks, and a further application may be necessary after a week or two treatment in the Massage Department.

The Splint, like all other splints, has its deficiencies, but they are petty and can be neglected when one considers the results gained.

Some advantages claimed for this Splint are:

1. Constant degree of dorsi-flexion.
2. Flexion is painless, continuous and easily graduated in the individual fingers.
3. Flexion is divided into two stages.
4. No impediment to circulation of fingers by encircling bands.
5. Accessibility of hand and greater part of forearm for massage and electric treatment without removal of the Splint.

This last advantage is of greater importance and has made it possible to use the splint in all cases whether traumatic, ischaemic, or functional.

ASTRAGALO-SCAPHOID DISLOCATIONS OF THE FOOT

BY ARCH F. O'DONOGHUE, M. D., IOWA CITY, IOWA.

Report of Five Cases from the Orthopedic Service, Iowa State University College of Medicine

In making a study of this condition which is by no means so rare as a reference to contemporary literature would seem to indicate, it is important to have a thorough understanding of the anatomy of the foot.

Even in the most casual examination of the foot one is struck by the great difference in both ligamentous and muscular support between the plantar and dorsal aspects. On the plantar side are many very strong and firmly anchored fascias. Mesially the calcaneo-navicular, the cuboideo-navicular, the cuneo-navicular, and the tarso-metatarsal ligaments strongly re-enforced by the tendons of the tibialis posticus and flexor longus digitorum muscles, form a bridge with the scaphoid as its keystone that is almost unbreakable; and laterally the heavy tough ligamentum plantare longum with the calcaneo-cuboid and intermetatarsal ligaments supported by the tendon of the peroneus longus form a second firm suspension for the tarsal arch. These supports are so powerful that actual fracture of the tarsal bones or of the external malleolus is as probable as a breaking down of these bands with dislocation and consequent traumatic valgus. The conditions are very different on the dorsum of the foot. Here we find a number of so called ligaments most of them but slightly thickened portions of the articular capsules (the stellate ligaments of Fick) and in no way comparable in strength with the plantar structures, and these are supported by but one small muscle, the peroneus tertius; the extensor digitorum cummunis being here so loosely applied that it really has no supporting action at all. Even with this rather inadequate support dislocation in Chopart's joint is not common, possibly because the peroneus tertius usually exerts a component towards the prevention of varus. This difference in the ligamentous support is also important in the treatment of traumatic foot deformities. In traumatic valgus either with or without fracture, if the deformity is reduced and the foot properly immobilized repair of the lacerated ligaments is so complete that such conservative treatment will usually suffice to bring about satisfactory return of function. This

is not true of traumatic varus for in this condition even though the dislocation be reduced early, it is so hard to maintain that the slightest trauma will effect a redislocation. Thus conservative treatment is usually a failure as it was in three of our cases. Probably the supporting power of even a small muscle like the peroneus tertius is underestimated. It is interesting that in each one of our cases of astragalo-scaphoid dislocation the foot was strongly plantar flexed at the moment of injury and the peroneus tertius being already stretched to its full extent may not have been able to exert its usual restraining action against the occurrence of such deformity.

FIG. I.—Case 1 before operation showng dislocated astragalus.

Report of Cases.

Case 1. Miss F. A. A servant girl, age 22 years. First injured her foot when a baby by "twisting it." She does not know any more details about the injury but she started to walk at the normal age. She states that the foot was somewhat turned in and that she had always limped slightly although she had no pain. Two months ago the patient was riding a horse which fell through a bridge. Her left foot was caught between the timbers of the bridge and the horse's body, being severely injured. She fell forward and to the right forcing the foot into extreme equino varus position. She had very severe pain and was carried home. The next day the foot was much swollen and discolored and still very pain-

Fig. II.—Case 1 after astragalectomy.

ful. Its position at that time was the same as on entrance to the hospital. A doctor was called who applied hot dressings but made no attempt at a reduction. After two months the foot was still so tender that it would bear no weight. The patient comes in for treatment.

Examination on entrance showed the foot to be in extreme varus position. There was no discoloration nor swelling. The head of the astragalus was distinctly palpable on the outer dorsum of the foot. The Tendo-Achilles was moderately contracted. The scap-

hoid could be palpated mesially and there was distinct depression proximal to it. There was no motion in the tarsal joint. The X-ray showed the scaphoid with all of the tarsal bones anterior to it displaced inward with the head of the astragalus lying above and resting upon the cuboid. The astragalus was dislocated antero mesially upon the tibia. There was no evidence of fracture.

Radical correction was determined upon and the patient operated on May 13, 1919. An incision was made arising from the outer malleolus and extending onto the dorsum of the foot over the head of the astragalus. The head and neck of the astragalus were removed, the dislocation reduced, and the wound closed. X-ray two weeks after operation showed the bones of the tarsus to be in their proper relation but the astragalus was dislocated anteriorly upon the tibia. This condition persisted in spite of carefully applied casts so on November 25, 1919, the foot was again opened and the astragalus removed using Whitman's technic. At present, four months after operation, the deformity is completely corrected with almost complete return of function although there is but one-third of the normal range of motion in the tarsal joint. There is one inch shortening.

CASE 2. Mr. E. D. Laborer. Age 28 years. Was in an automobile accident 15 weeks ago. Was thrown from the car and fell facing the car with his entire weight on the outer aspect of the right foot. He had immediate severe pain and was taken to a doctor who said the foot was dislocated, attempted to reduce it, and applied a splint. The patient says that the positions of the foot immediately following the injury and on entrance were identical. The foot became much swollen and discolored and was rather painful. The swelling and pain subsided in a couple of weeks but he was unable to place any weight upon it because of tenderness. He comes in for treatment. Patient was first seen on September 23, 1919.

At that time examination showed the foot to be in mild equino varus position. There was no discoloration or swelling. The head of the astragalus was distinctly palpable over the outer dorsum of the foot. Mesially the scaphoid was very prominent and there was a distinct depression proximal to it. No motion in the tarsal joint was possible. The Tendo-Achillis was not contracted. X-ray showed the scaphoid with all the tarsal bones anterior to it dis-

located mesially. The head of the astragalus lay above and rested upon the cuboid. There was no evidence of fracture.

Radical treatment was decided upon and the patient etherized on October 14, 1919. Manual correction was attempted and was unsuccessful. Incision was then made arising from the external malleolus and extending upon the dorsum of the foot over the head of the astragalus. Reduction was again attempted. Failing in this the head and neck of the astragalus were removed, reduction accomplished, periosteal sutures passed between the astragalus and scaphoid, and the wound closed. The foot was dressed in plaster for three months with complete correction of the deformity.

FIG. III.—Case before operation showing dislocation in astragalo-scaphoid joint.

Massage and baking were then instituted and at present, five months after operation, there is complete return of function and the patient walks without a limp although there is but half the normal range of motion in the tarsal joint. X-ray on discharge shows the tarsal bones to be in their normal relations.

CASE 3. Mr. D. R. B. Farmer. Age 44 years. Was thrown from a horse ten years ago alighting upon the side of his left foot and falling face downward. He had immediate severe pain in his foot which he says was "turned in." A doctor was summoned who straightened the foot out and applied hot dressings. The foot was much swollen and discolored the next day and the pain and swelling persisted for several weeks. The patient was unable to work for six months because of extreme tenderness on weight bearing. From that time until two years ago he has had fair use of his foot although he has repeatedly "turned" it with resulting pain and tenderness on walking for the next few days. Six years ago he obtained a brace which has helped somewhat in stabilizing the foot, but did not hold it firmly enough to prevent injury. For the past two years he has been walking with increasing difficulty and has been unable to work. He comes in for treatment.

He was first seen on September 10, 1919. At that time the foot showed decided varus tendency with some swelling around the external malleolus. There was no discoloration and the Achilles tendon was not contracted. The foot could easily be manipulated into quite extreme varus and when in this position the head of the astragalus was palpable on the outer dorsum of the foot over the cuboid. Mesially the scaphoid was unduly prominent with a marked depression proximal to it. Motion in the tarsal joint was distinctly limited. There was considerable tenderness on weight bearing and the patient walked with a decided limp. X-ray examination with the foot in normal position showed no bone pathology. There was no evidence of fracture.

Radical treatment with suturing of the dislocated bones was advised but the patient wished first to try conservative measures. Accordingly the foot was dressed in plaster in corrected position and the patient discharged. He was seen again two months later. The foot was still very tender on weight bearing and another cast in over correction was applied. One month later the patient was again examined. The foot seemed perfectly corrected when at rest but still showed varus tendency on weight bearing. The tender-

ness was greatly diminished however so he was given a shoe with an outer wedge and an Orr brace with varus strap and discharged for six months. One month later he returned complaining of much pain on walking and another cast was applied. He was last seen February 28, 1920, at which time while the foot seemed completely corrected when at rest it still showed varus tendency and considerable tenderness on weight bearing.

CASE 4. Miss M. H. Student. Age 18 years. Was attending a basket ball game on February 2, 1920, when the grandstand collapsed throwing her forward upon her face while her foot was held fast by a fallen plank. She had severe pain in the foot and was immediately taken to the hospital.

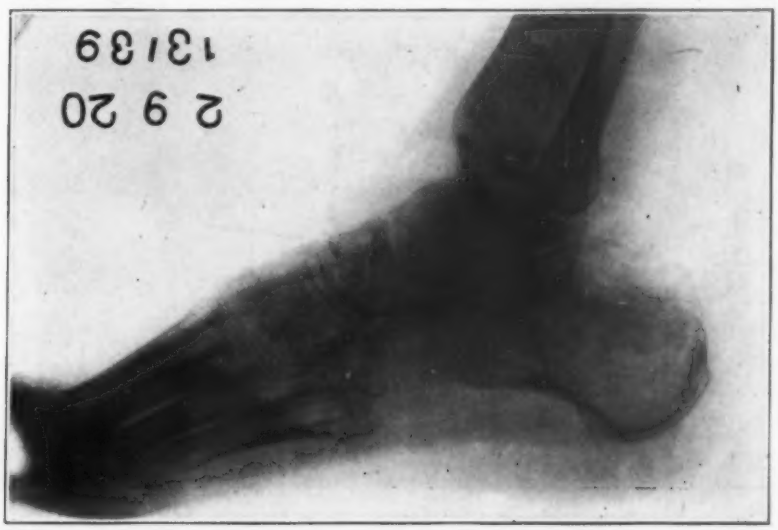


FIG. IV.—Case 2 after resection of caput tali.

Examination showed the foot to be in decided varus position and there was already considerable discoloration and swelling. On palpation the head of the astragalus could readily be felt on the outer dorsum of the foot over the cuboid. Mesially the scaphoid could be felt, displaced one inch inward with a distinct depression proximal to it. X-ray examination confirmed the diagnosis of a dislocation of the scapho-astragaloid joint but gave no evidence of fracture. On the next day reduction was easily obtained under gas and the foot dressed in plaster but immediate X-ray examin-

ation through the cast showed the bones slipped out of position. The cast was removed two days later, reduction was again made under anesthesia. Reduction was easy, but very difficult to maintain, the scaphoid slipping out of position with much ease. A plaster dressing was applied. X-ray examination after operation showed the bones to be in place and the patient had considerable relief of pain from the maneuver. The next day, however, she was suffering severe pain and another X-ray showed the luxation to have again occurred. The cast was removed and a week allowed for the swelling to subside. An incision was then made over the scapho astragaloid articulation. The head of the astragalus and the entire

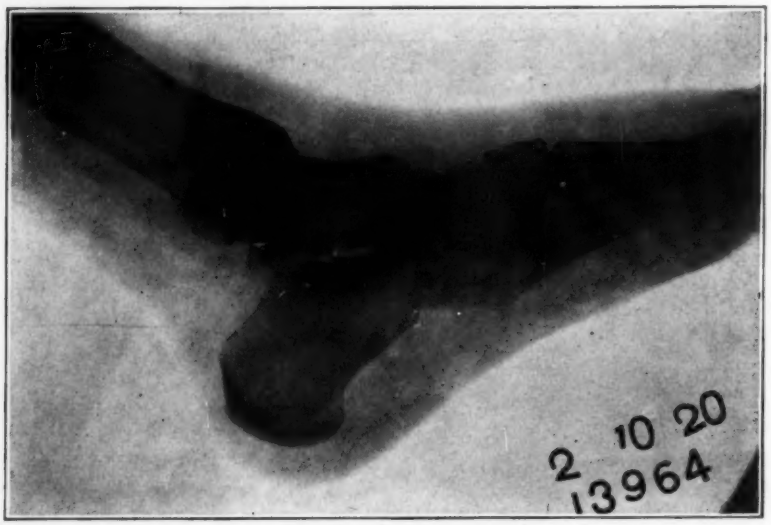


FIG. V.—Case 4 before operation showing luxation in Chopart's joint.

scaphoid were decidedly atrophic and an attempt to drill holes in them for wiring was unsuccessful. The scaphoid therefore was held in position by means of three heavy wire sutures passed through the head of the astragalus. Incision was closed and a plaster dressing applied. An X-ray examination showed the bones to be in proper alignment and a week later, the wound being closed, the patient was discharged. She was seen again one month after operation at which time there was no deformity evident either by manual or X-ray examination. Plaster dressing was applied and the patient discharged.

CASE 5. Master A. R. Schoolboy. Aged 14 years. Injured his right foot one year ago. He was running down a railroad track and caught his foot in a frog. He fell forward and to the left wrenching the foot. He had immediate severe pain and was carried home by his playmates. A doctor was called who diagnosed a sprain, applied a tight bandage, and advised the patient to stay in bed two weeks. The foot did not swell or become discolored and

FIG. VI.—Case 4 after operation.

after a few days he started to use it although the pain forced him to limp considerably. At the end of a month the foot seemed normal, when he again "turned it." This has happened with increasing frequency since that time and for the past month he has scarcely been able to walk at all with his boot off because of the tendency to turn his foot. Comes in for treatment.

He was first seen on March 6, 1920. At this time the foot appeared normal on inspection when at rest. There was no swelling or discoloration. When asked to walk however, he showed a decided limp with tendency to varus and the toes were strongly hyperextended whenever weight bearing was attempted. On manipulation the foot easily went into varus position and when in

FIG. VII—Case 5 before operation.

this position the head of the astragalus could be palpated on the outer dorsum of the foot lying over the cuboid. The scaphoid could be palpated mesially with a distinct depression proximal to it. X-ray affirmed diagnosis of habitual dislocation in the scapho-astragaloid joint. Radical treatment was advised.

The patient was operated March 13, 1920. An incision was made arising from the outer malleolus and extending up over the dorsum of the foot above the head of the astragalus. Extensor tendons were retracted and the head of the astragalus was firmly

anchored to the scaphoid by heavy periosteal sutures. The torn talo-navicular ligament was then repaired and the wound closed. The foot was dressed in plaster in valgus position. X-ray after operation showed the bones of the tarsus to be in normal alignment.

It will be noticed in each of the above cases that at the moment of injury the foot was strongly dorsi flexed and the peroneus tertius being already stretched to its full extent was unable to exert a component to prevent the occurrence of varus. This margin of safety being absent the deformity was only guarded against by the dorsal interosseus ligaments which proved unequal to the strain. It will further be seen that the dislocation was always in Chopart's joint which is the weakest link in the entire chain, being protected dorsally only by the dorsal scapho-astragaloid ligaments. In all these cases examination showed the head of the astragalus palpable on the outer dorsum, the scaphoid unduly prominent mesially, and with a distinct depression proximal to it. In no one of this series was there evidence of fracture.

In cases 3, 4 and 5 in which conservative treatment was tried it proved ineffectual. Case 3 has been under conservative treatment for almost seven months with practically no improvement in the stability of the foot, and in cases 4 and 5 radical measures had to be employed because of the repeated failure of conservative ones.

In cases 1 and 2 where open operation was done and in which sufficient time has elapsed to show a result the reduction seems permanent and the return of function adequate. And in cases 4 and 5 in which open operation was resorted to when it was determined that reduction could not be maintained otherwise the correction seems satisfactory although of course not enough time has passed to make a positive statement.

In case 5 it was very interesting to see the marked reflex contraction of the extensor communis digitorum in its effort to prevent varus on weight bearing, illustrating again the importance of muscular action in the maintenance of equilibrium in the foot.

CONCLUSIONS.

1. Scapho-astragaloid dislocations usually take place when the foot is supinated and plantar-flexed.

2. A palpable caput tali and a prominent scaphoid with a depression proximal to it is the most important physical sign of dislocation in the scapho-astragaloid joint.

3. Open operation is usually indicated in order to hold a satisfactory reduction.

4. Resection of the head of the astragalus is often necessary in cases of more than two weeks standing.

I gratefully acknowledge the co-operation of Dr. A. Steindler in whose clinic these cases were observed and treated and whose help has made their study possible.

TREATMENT OF FRACTURES OF THE UPPER END OF THE HUMERUS BY A MODIFIED CRANE SPLINT

By Frank E. Peckham, Providence, R. I.

In all fracture work it is desirable not only to get union but to get it with the callus just where it is needed i. e. between the fragments and not with a large lump *surrounding* the broken ends. Another important thing from the patients point of view is to get as perfect restoration of function as possible. This is best accomplished by having the bone in perfect alignment longitudinally and also with reference to the rotation of the fragments. The short fragment in the upper end of the humerus has been somewhat of a bugbear and it has been considered necessary to abduct the arm or long fragment in order to place the broken ends in good apposition. A recent writer has arranged a splint to which extension may be applied and not only puts the arm in *external* rotation but at the same time puts the patient to bed.

In considering any fracture, the treatment should if possible tend toward simplicity and away from complexity. In studying

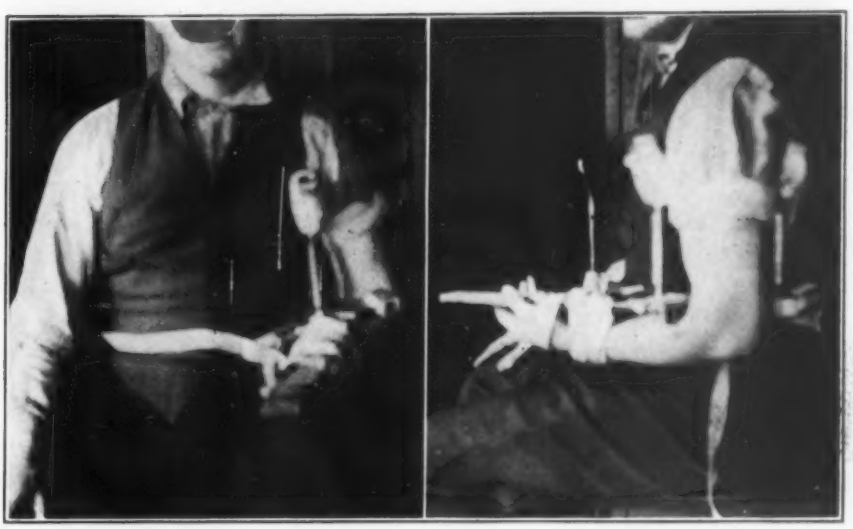
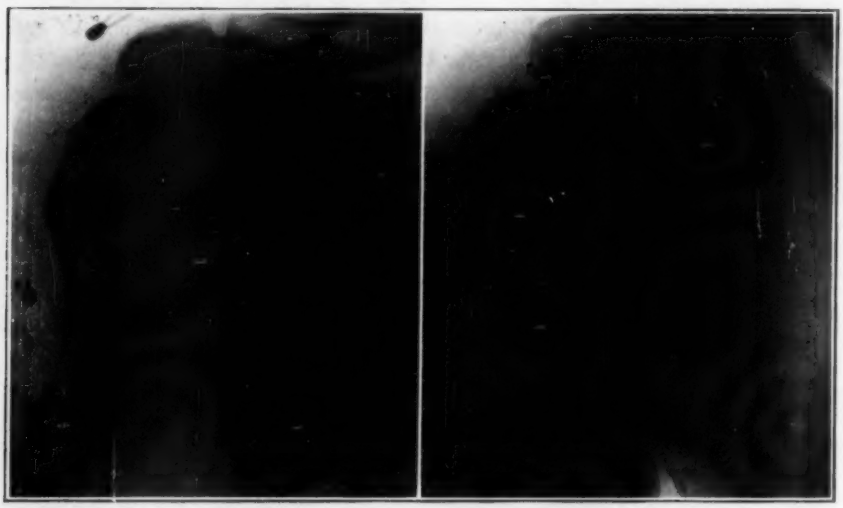


Fig. 1. Fig. 2.

Showing the splint held in place by the patient.

these cases the position which would naturally hold the fragments of this particular fracture in apposition, was with the arm at the side and the forearm, neither internally nor externally rotated but *straight out in front.* If possible the reducing mechanism of a fracture should be the mechanism which is going to hold it permanently in place when reduced.

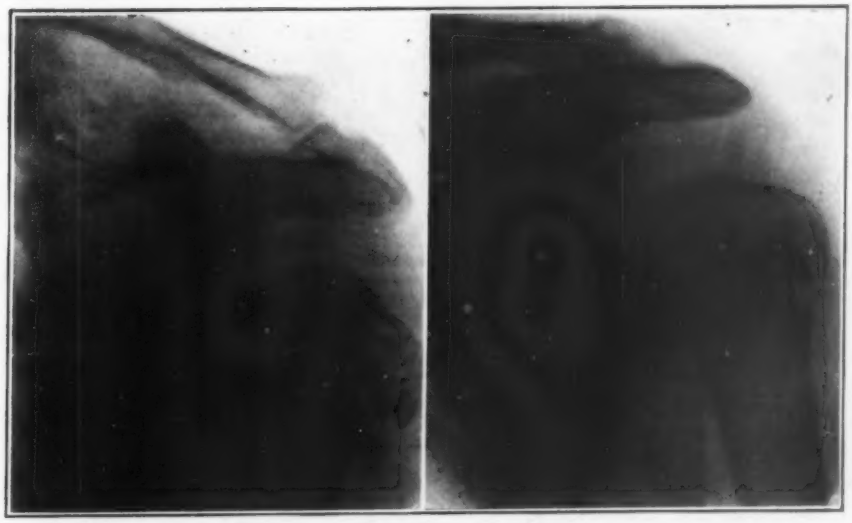
In the Journal A. M. A., July 1, 1911, Dr. A. A. Crane of Waterbury, Conn., described a splint with screw attachments which created extension and counter extension by pressure against the



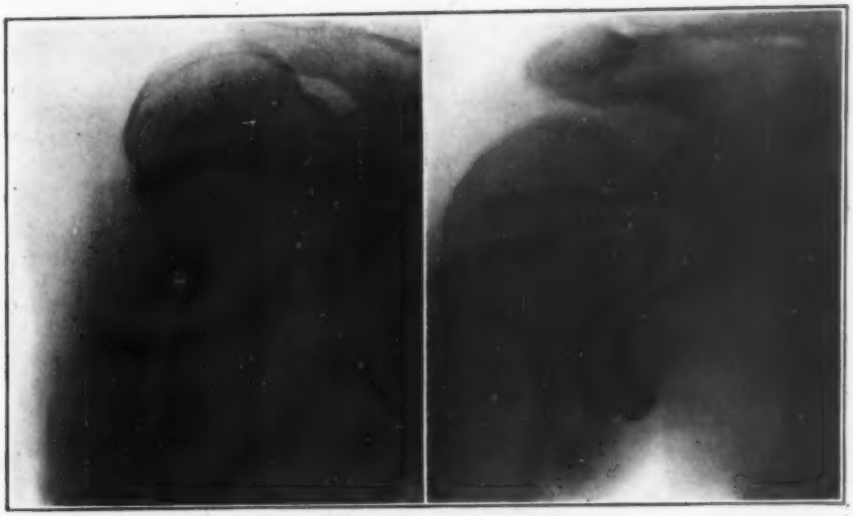
CASE 1.

axilla, at one end of the arm and at the other end against the forearm held at a right angle. In his splint the arm was slung across the body in front, thus internally rotating the long fragment. In my own work the fragments could not be held very well because of this internal rotation. A study of cases led me to modify the splint so that it would hold the arm straight out in front. After that it was plain sailing and the treatment of any of these fractures at the upper end of the humerus was very simple. However, like all mechanisms it needs constant attention to keep it 100 per cent efficient and also to keep the patient comfortable.

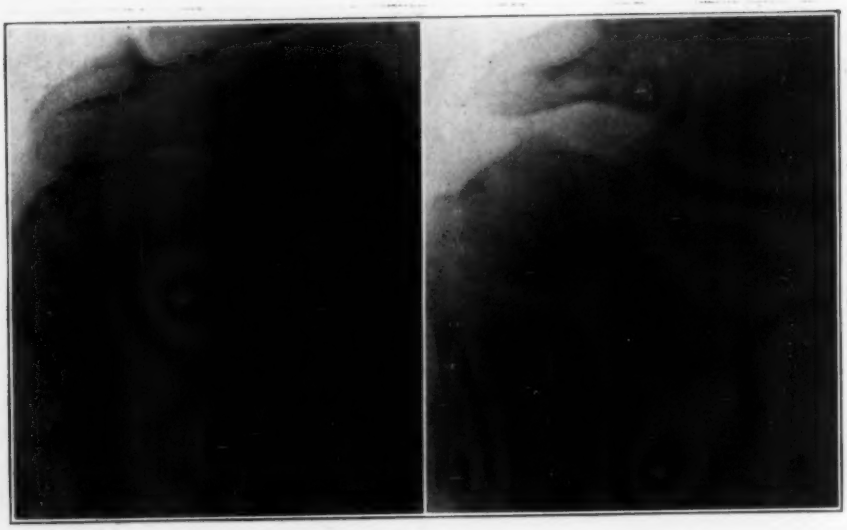
The Modified Splint is rather difficult to describe but the photographs in Fig. 1, 2 and 3 give a pretty good idea of the mechanism.



CASE 2.



CASE 2.—Comminuted Fracture.



CASE 3.

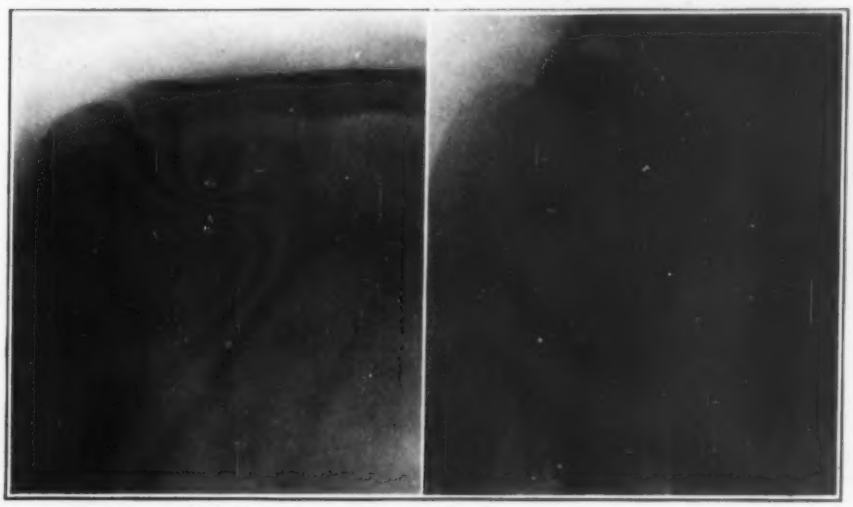
CASE 4.

Fig. 3 shows the splint with the curve which fits around the body at the waist line, the curved axillary crutch at the top and the long anterior arm under which the forearm and hand are strapped and bandaged.

In Fig. 1 the patient was simply holding the splint in position for illustration.

In Fig. 2 the splint is shown in actual use.

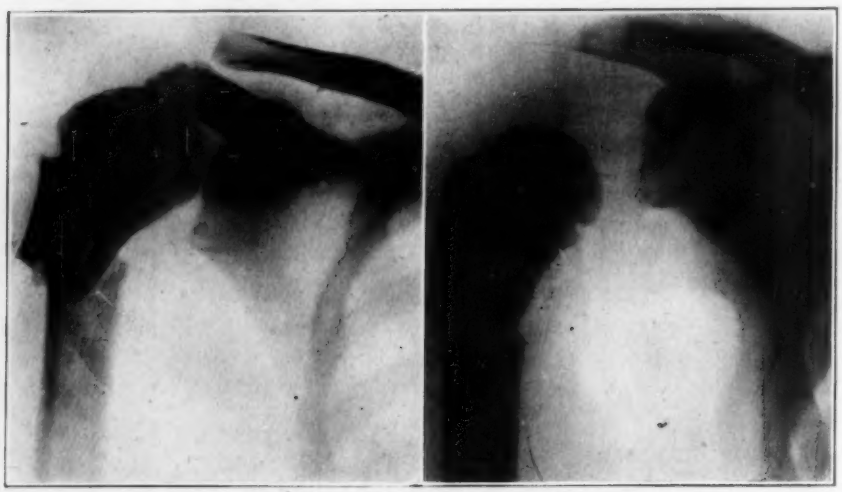
The strap of webbing extending around the waist is covered by a much wider strip of adhesive plaster to prevent slipping. This keeps the arm out straight in front, thus preventing internal rotation. A wide strip of adhesive plaster is passed around the extreme end of the anterior arm of the splint, up over the shoulder and continued diagonally downward across the back. This holds the forearm up at a right angle and prevents anterior deformity. The splint is easily applied, ether is unnecessary and there is practically no discomfort in its application. The patient neither has to go to bed nor have the arm in the unsightly and awkward position of abduction.



CASE 5.

Cases 1, 2, 3, 4, 5 and 6 are very well shown in the roentgenograms before and after reduction. Case 7 was a boy who not only

had a fracture of the surgical neck of the humerus but such other injuries, that bed treatment was necessary. With the arm at the side of the body, an extension was applied the whole length of the arm from the level of the fracture, the cord extending over a pulley at the foot of the bed. Counter extension was obtained by a padded band of webbing, under the axilla, the cord extending over a pulley



CASE 6.

at the head of the bed. The roentgenograms show the condition of the fragments before and after its application.

These cases demonstrate that with the arm in the position described, extension and counter extension will positively reduce such fractures and the splint illustrates how they may be treated in an ambulatory manner.

SUGGESTIONS FROM THE BRACE SHOP

By Robert V. Funsten, M. D.

Asst. in Orthopaedic Surgery, in charge of Orthopaedic Shops, Children's Hospital, Iowa City, Ia.

From the Orthopaedic Service of the Iowa State University Medical School.

We have realized from experience gathered during the war that standardization of mechanical appliances in Orthopaedic Surgery may be accomplished to the greatest possible advantage.

We have made an effort in our work at the Children's Hospital to standardize our own braces for similar reasons. By this is not meant any standardization in size, except in cases of hand splints and the like, but rather in the working design. We believe that no brace should ever be used that is not designed to fit the exact measurements of the patient requiring it. But, by having a clear understanding of the end to be accomplished, and the means of accomplishing it, the shop is able to put out better braces and at a more rapid rate of speed than it could do otherwise.

Let us take up a few selected braces from the following standpoints: First, mechanical function; second, durability, lightness, comfort and cost to the patient; third, simplicity and standardization in construction.

(A) Body Braces

They are used in the various stages of scoliosis, fractures, Pott's disease, back strains and post-operative spine cases.

In all of these the principal mechanical function is that of support, and this support must come from the pelvis. How can this best be obtained and what is the most effective way of gripping the pelvis so as to withstand considerable pressure from above? The basis of all our standard body braces as designed by Dr. Steindler, is a firm grip above and below the entire crest of the ilium, encircling the anterior superior spines. This gives a firm, stable pelvic girdle which grips just above the trochanters on the

sides, and rises up slightly in front to allow complete flexion of the leg. The band above the crest offers a secure barrier against downward movement of the brace.

Having this basis to build upon let us look to the accomplishment of our support from above. We have only two possible means of extension, by the chin and occiput, and under the shoulders. In

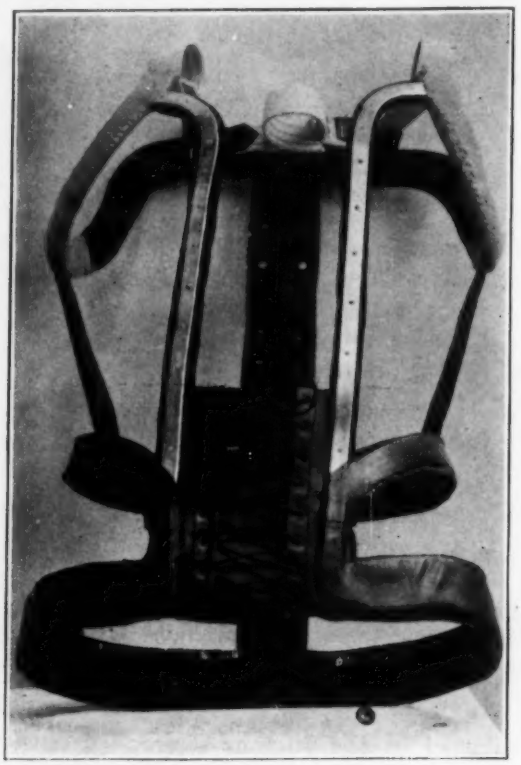


FIG. 1.—Standard body brace.

cases of scoliosis we know that it takes, in the standing position, from 50 to 100 pounds to accomplish any appreciable correction in an adult. It is, therefore, beyond belief that any patient could stand a corrective brace designed on such a working principle, and one must necessarily resign himself to the principle of immobilization. For cases requiring support from the mid-dorsal region downward, a brace with properly designed and fitting crutches and

a firm pelvic girdle, will answer the requirements of support. This is done by means of two strong steel stays up the back, a cross bar extending about the level of the spines of the scapulæ, ending in firm crutches under the arms. The foremost part of the crutch is flattened out to exert some pressure backward just below the clavicle. They are well supported in front by anterior steel stays

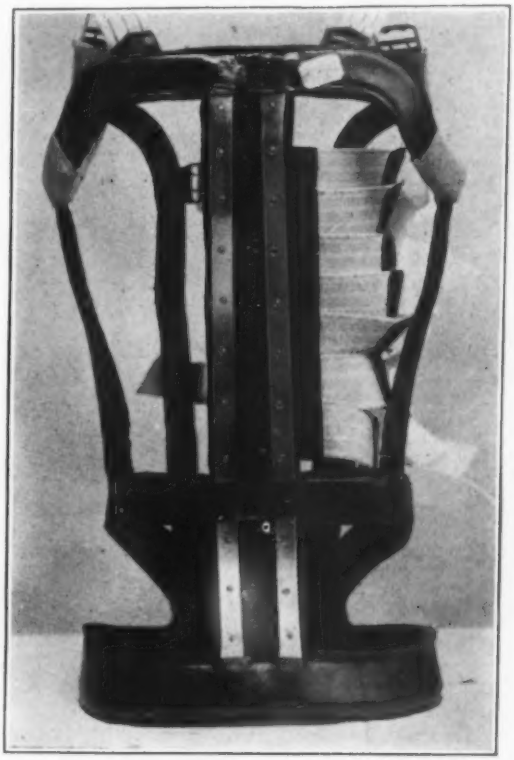


FIG. 2.—Back view, showing elastic straps over prominence of ribs.

extending down to the girdle. To give the crutches further support, a flat steel bar is run from their center down to the girdle-band just above the crest, as may be seen in Fig. 1, 2 and 3, these braces are firm but very light. The sheet-steel parts are covered on the outside with calf skin and on the inside with felt, except for the stays which are polished or plated.

Where a curvature is being dealt with, eight to twelve one-inch adjustable elastic bands are fastened in front and behind to the steel stays over the prominence of the ribs in a diagonal position exerting pressure upward and forward.

It takes approximately eight to ten hours for this brace to go through the different departments of the shop, at an actual cost of $20 to $30.

FIG. 3.—Showing firm pelvic grip and crutch support.

We have found that in getting a good fit in cases of extreme scoliosis it is very necessary to trim the models down one-half an inch to an inch from under the arm on the side of the curvature. This is not made up for under the other arm. It is also important in taking the model to give the bracemaker every possible benefit of corrected position.

This brace has proved itself entirely satisfactory from every standpoint. We feel that we can trust it to maintain any correction accomplished in scoliosis, any post-operative case, or any tuberculous case to which we wish to assure proper support. Still we do not infer that this or any other body brace that has come under our observation, is adequate, in cases of high dorsal or cervical curvatures to insure even maintenance.

No attempt is made to correct a curvature with the brace. It is used only as a support.

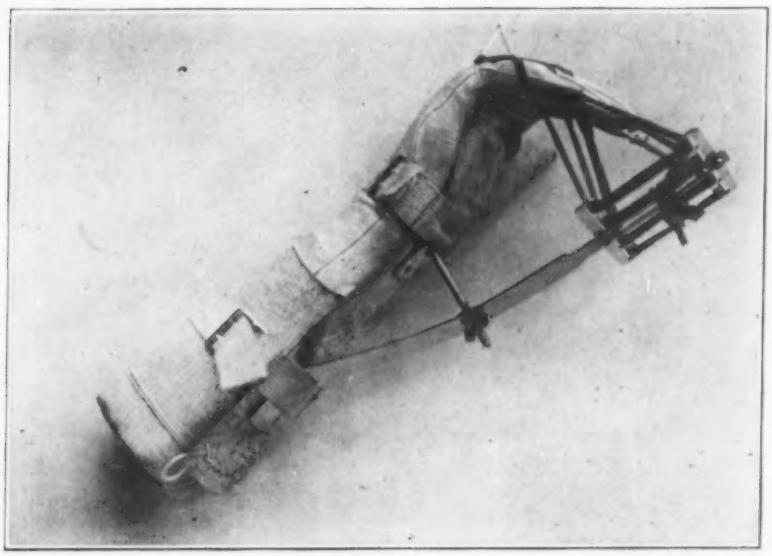


FIG. 4.—Cock-up double-traction splint, showing how traction is applied by means of a glove.

B. GLOVE TRACTION SPLINT

There have recently been many varieties of cock-up traction splints advocated upon various sound mechanical principles. We have been making in our shop a cock-up traction splint which has been used very effectually in cases of Volkmann's contracture, Claw Hand, and other flexion and hyperextension deformities of the metacarpo-phalangeal joints, such as are met with in trauma, nerve injuries and arthritis deformans. The principle, as has been previously described by Dr. Steindler, is a two-way traction sys-

tem. A cock-up splint covered with felt is the basis. Two adjustable T-bars are placed on a strong spring-steel shaft in such a way that direct horizontal tension is applied to the distal portion of each finger and a perpendicular tension to correct the deformity in the metacarpo-phalangeal joints. Owing to the difficulty in attaching any pulling apparatus to the skin, a good fitting glove with leather strips sewed upon it is used. The apparatus with the glove applied may be seen in Fig. 4.

The mechanical problem in the flexion contracture of the fingers is the stretching of the flexor tendons and the capsular structures of the joint. The tendons are made taut by the cock-

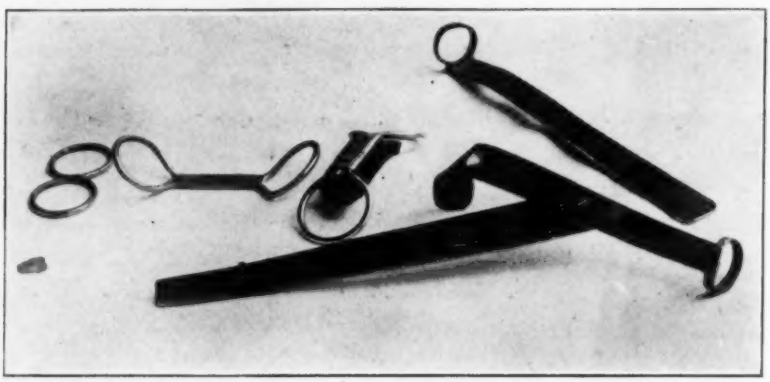


FIG. 5.—Individual finger splints. Figure-of-eight splints and two varieties of ring splints.

up, increasing the flexion in the fingers. The horizontal pull tends to overcome flexion in the phalangeal joints, the perpendicular pull hyperextension in the metacarpo-phalangeal joints.

This splint is light, durable and may be regulated in its pull to the endurance of the patient. It can be put out in one and one-half hours at a cost of $3 to $4. We have had uniformly good results in its use. This splint may be varied according to the necessities. In one case of arthritis where there was marked hyperextension of the inter phalangeal joints, heavy wire was used in form of loops, one extending around the wrist dorsally over the joints, while the other was arranged to get a horizontal and downward pull from the finger tips.

(C) Finger Splints

Where there are many cases of injury to the hand and fingers, and especially cases where skin grafts are done, the after-splinting becomes a very important factor in the end result. Palmar splinting with tongue depressors and the like may serve for a time after the operation, but when contraction of the scar tissue begins, it takes more than this, and more than 15 to 30 minutes of massage and stretching daily to obtain everything there is to be obtained. The ingenuity of the surgeon is sometimes considerably taxed when he feels that the apparatus in use is, through discomfort or difficulty to hold in place, not doing everything it should.

The most satisfactory individual finger splints with which we have come in contact, are shown in Fig. 5. They are, from left to right:

The Figure-of-eight splints, used in either flexed or hyperextended fingers. They are made of wire and may be manipulated to sustain whatever position is desired, and may be placed on the finger easily by putting them first upside down, then turning them. Small pieces of felt are used where pressure is exerted.

Above, is a ring splint, for the second, third, fourth or fifth finger, and below, for the thumb. These splints are easily applied and we have found them unusually well tolerated by the patients. They stay on well and may be bent to exert any amount of pressure. Pressure points here also are protected by small pieces of felt. They are best maintained by placing a strap or broad piece of adhesive just above the wrist. In one case of skin graft for congenital contracture where the operative outcome was uncertain, a ring splint was applied with an entirely satisfactory end result.

(D) Supination of the Arm: Fig. 6.

The mechanical problem here is to obtain the best possible grip for rotation of the forearm and wrist. This is best accomplished above by gripping the humerus while the elbow is flexed. In order that this gripping may withstand rotation two circular bands are used, one high up and the other as close to the elbow joint as possible. The palm of the hand offers the most durable

gripping point distally, and here an oval band through which the four fingers are thrust is employed. To steady the brace and prevent rubbing, another band is made just above the wrist joint.

The brace is of very simple construction, being made of 3/16 inch. Bessemer rods with the bands brazed on. It is made in less than an hour at a cost of about $1. The amount of supination may

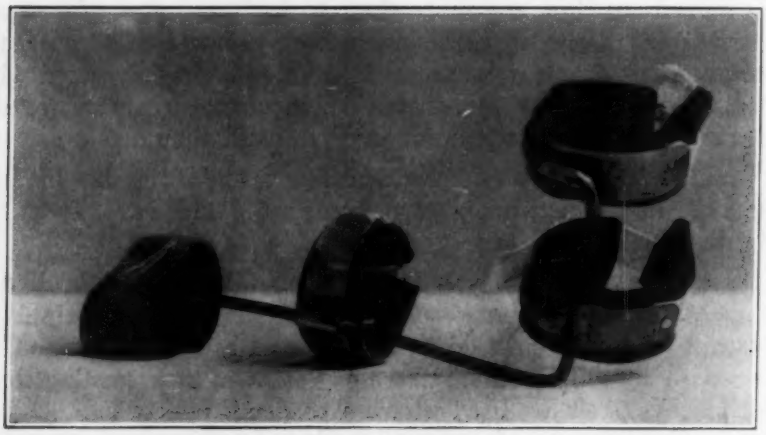


FIG. 6.—Light splint running along inner side of arm to counteract pronator contracture.

be adjusted at will. It is very useful in pronator contractures and also maintains the wrist in a hyperextended position as desired. The patient wears this brace with considerably more comfort than any other supination brace we have tried.

(E) FELT ARCH SUPPORTS

When the trend of Orthopedic opinion led so completely away from solid arch supports of any kind, it became necessary to introduce some means to give temporary relief in the various foot strains. Orthopedic heels, wedges and strapping with adhesive and felt pads have done much to aid in this way. Still in the majority of these cases after the acuteness of the affair has subsided, the strapping becomes a hindrance to the institution of foot exercises, and it has been necessary to give this temporary support in some other way.

In addition to the Orthopaedic heels and wedges, we have been using in our work a temporary arch support made of common thin-leather insole, upon which is sewed two, three or four thicknesses of felt arranged in concentric lamellae. We rely entirely upon the pedographic picture, as advocated by Rich, to determine what shape

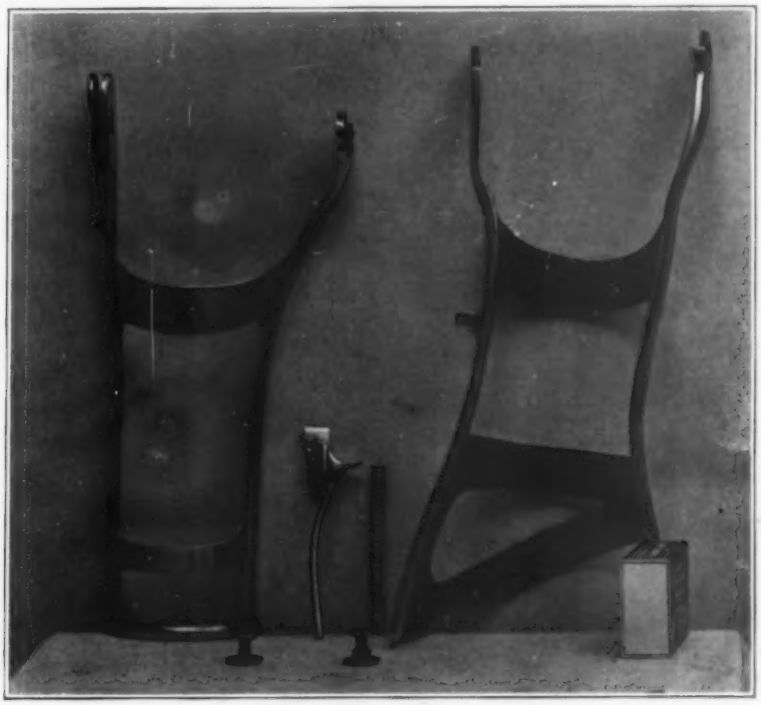


FIG. 7.—Unassembled lock-knee joint, showing two types of milled joints.

this support shall be, whether or not it shall have a tongue to support the anterior arch and whether or not it shall extend entirely across the foot. In cases of acute foot strain where there is often a cavus, much relief seems to be given by extending the felt entirely across.

(F) LEG BRACES

Joints: The question as to how and where a knee joint should be placed is a matter of considerable concern. It is not practical to duplicate the exact mechanical action in the knee joint (Braasche Sector Splint). The flexibility of the soft parts upon which the

sustaining bands rest will of themselves allow considerable change of position. An important essential in a successful knee joint is to get the hinges as near as possible to the center of the tuberosities of the femoral condyles.

FIG. 8.—Lock-knee joint of the tongue-and-groove type, showing mechanism.

But the most important fact about any joint is that it is a mechanical thing and must obey the law of mechanics. It is, therefore, absolutely necessary to the proper working of any joint, whether in the knee, ankle or elbow, that the gliding surfaces of the pair be in the same horizontal and the same parallel plane one with the other. There should be no attempt, therefore, to force a joint in any way to conform to the model. It should be a mechanical thing apart.

The two types of joints that have obtained greatest favor with us are the tongue-and-groove joint (as seen to the left in Fig. 7), and the circular milled joint (to the right in Fig. 7). The former lends itself more readily to the lock-joint attachment, one type of which is shown in Fig. 8.

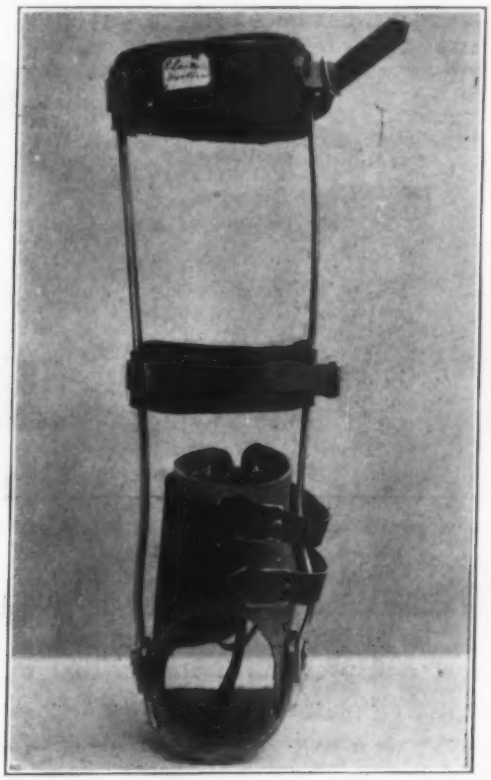


FIG. 9.—Short leg brace showing upper part of foot plate, anklet, and alignment of joints.

The circular milled joint has a bushing on the male part over which the female part glides. In this way the connecting bolt may be thoroughly tightened without interfering with the motions.

Note in Fig. 9, that there is considerable allowance for the desired varus correction. However, the joints work with each other in all planes.

(G) Foot Plates and Anklets

We have standardized our foot plate as follows: It reaches only to the ball of the foot; it rests flat in the bottom of the shoe conforming with a slight arch to the foot; it is built to fit the foot in the corrected position and no foot needing correction is fitted with a foot plate until it has been corrected.

Fig. 10.—Heavy iron bench-block with various attachments. There are several sizes of the iron foot models.

The foot is maintained in position by an anklet which extends from the ball of the foot to well above the ankle. This gives considerable support and prevents irritation that might arise from the uprights.

Fig. 10 shows a heavy iron bench block with a number of attachments which are of great value in brace work. They can easily be obtained from a foundry upon furnishing a wooden or plaster of Paris model.

I should like to say in conclusion that a thorough system of order cards and a double card-file system, used even for the most minute piece of work, is of inestimable value in the successful running of a brace shop.

Special Article

THE SURGICAL TREATMENT OF SCOLIOSIS

By A. Mackenzie Forbes, Montreal.

The thorax moves as a whole. No vertebra or no rib is moved singly. The thorax moves as a whole and each component part has its own part to play during any movement of the thorax. Physiological movements of the thorax are intricate. Physiological scoliosis is a complex condition. Pathological scoliosis is equally complex and differs only from physiological scoliosis in that in physiological scoliosis there is a return to the normal whilst in pathological scoliosis there is no return.

For these reasons the correction of a pathological scoliosis is difficult. It was suggested some years ago that the rational treatment for pathological scoliosis was to produce a physiological scoliosis of a reverse character, but it has been rightly contended by the author of that method of treatment that vertebrae which have been pathologically changed, now being wedge shaped, are carried individually and collectively into a new position by the production of this physiological scoliosis forming, indeed, an area of pathological scoliosis of a reverse character to the physiological scoliosis now produced. In other words pathological scoliosis is a more advanced condition than physiological scoliosis. We cannot cure the greater by the less.

It has been contended that in certain methods of treatment forces which are applied to produce a beneficial result in one place may produce the reverse in another.

It cannot be denied that there are patients afflicted with scoliosis of such degree that no form of treatment yet devised can be depended upon to relieve their deformities.

May we say that all schemes or methods of treatment for scoliosis have their limitations? Surely we may contend, without exaggeration, that this is true.

Assuming, then, the truth of this assertion, we will agree that we must accept as inevitable certain degrees of scoliosis. In the treatment of such degrees of deformity we have to content ourselves with two things only. First, to obtain the best correction possible. Second, to maintain this correction.

Various methods have been devised to obtain the greatest possible correction of scoliosis. Many believe that of all methods that of Abbott can best be depended upon to give correction. Calve also has made an important contribution to our knowledge of corrective methods. The Scoliosis Commission of the American Orthopedic Assn. have reported that the Lovett

method has, in practice, shown the best results. The writer still believes that the production of physiological scoliosis, of a reverse character to the existing pathological scoliosis, is the most rational method. The writer still feels that the degree of physiological scoliosis obtainable depends on previous treatment conducted on rational lines. But the writer again contends that in that class of patients suffering from scoliosis where the vertebrae, ribs and trunk are deformed, all methods can be considered, only, as a preliminary part of further treatment. Further he believes that operative procedures alone can be depended upon in certain cases of scoliosis.

As yet no operative procedures have been devised to eradicate the deformities of pathological scoliosis, but if the physiological principles first annunciated by Feiss may be considered as proved then the thorax moves, as a whole, and we may maintain any correction which may be made by such measures as fixing or welding together the vertebrae which have been placed in a position of as great correction as possible.

Doubtless there must be many ways of doing this. In 1913 the writer reported a case of operation for the relief of structural scoliosis following Poliomyelitis. Since his return to this country he has been attempting to secure fixation by freshening the surfaces of the laminae and spinous processes of adjacent vertebrae, in a very similar way to that originally used by Hibbs of New York in the treatment of Potts Disease of the spine.

The efficiency of this procedure has been demonstrated recently, when the spine of a patient who had undergone this operation over a year ago was exposed. Over the spinous processes and laminae a strong bridge of bone had formed. This held the vertebrae as though welded together.

The actual operation is usually carried out in two stages. The lumbar curve is usually operated upon before the dorsal curve. A correcting plaster is applied as early as possible, indeed not later than a week after the operation. The patient is maintained in this plaster for at least three months.

In conclusion the writer would say again that he does not believe that any method has been devised for the rapid and complete reduction of pathological scoliosis. Ofter the operator must be satisfied with a comparatively moderate correction of the existing deformity. In such cases operative procedures are recommended as precautionary measures to prevent an anticipated progressive deformity. In many patients almost any procedure would be justified to allay the progress of this condition.

Editorial

The following is taken from the editorial pages of the Medical Record of May 1. (Italics are ours.)

One of the surgical lessons of the war, learned largely through the labors and teaching of Professor Willems of Belgium and Mr. Dowden and others of England, is the *undesirability of immobilization in the treatment of broken bones, not only gunshot fractures but those occurring in civil life as well.* Mr. William Guy, writing in the Edinburgh Medical Journal, March, 1920, applies this principle of mobilization to the treatment of fractures of the mandible. He is of the opinion that there is no fracture on which there has descended with greater malignity what his friend Mr. Dowden has called "the curse of immobilization." Guy quotes from Lucas Championniere's classic "Traitement des Fractures par le Massage." In support of the view that prolonged immobilization is usually contraindicated in the treatment of fracture of the mandible. Guy describes at some length the technique of the methods for treating different kinds of fractures of the mandible. He even goes so far as to believe with his mentor, Lucas Championniere, that the dictum that movement is necessary for the successful treatment of fractures is even more applicable to compound than to simple fractures, and acting on these principles he has treated over four hundred fractures of the mandible caused by gunshot wounds of every degree of severity. In the result he is confirmed in his conviction that "le mouvement c'est la vie."

The above is a part of the reason why we have had and shall have difficulty in securing the general adoption of adequate splints for the fixation of fractures. Harm may have been done occasionally by the too prolonged immobilization of joints in the immediate vicinity of infected fractures. Much more harm has been done, however, by failure to adequately immobilize fractures—and such teaching as the above is harmful beyond computation.

Personal

At the meeting of the Central States Orthopedic Club in Memphis, April 26, Dr. F. J. Gaenslen of Milwaukee, was re-elected Secretary. Dr. H. Winnett Orr, was elected President. Dr. Willis E. Campbell showed a large number of interesting cases and entertained the visiting members most generously.

Dr. M. S. Henderson was elected chairman of the Orthopedic Section of the American Medical Association at the meeting in New Orleans. Dr. H. B. Thomas of Chicago was re-elected Secretary for three years.

The section meeting was well attended and well conducted. Dr. Roland Hammond of Providence, Rhode Island, presided in the absence of Dr. Hawley. Dr. Ridlon was re-elected to represent the Orthopedic Section in the House of Delegates.

"Sir William Osler as Host to Americans in England during the war," is the title of an article by Dr. George William Norris in the American Journal of the Medical Sciences for May. This article will be of interest to a number of Orthopedic surgeons. It contains a portrait of Sir William in uniform. The writer of this paragraph recalls a visit during this period by Sir William to one of the hospitals where Americans were on duty. Among others Dr. Mahmud Bayami of Cairo was presented to him. In just a few moments they were deep in a discussion of the writings of Rhazes and Avicenna in the original Arabic. Sir William with great enthusiasm said, "Ah, they were great days—I wish I could have lived then."

Speaking at the Cardiff Medical Students Club on April 23, Sir Robert Jones is reported by the "Western Mail" to have spoken in part as follows:

"A fundamental and essential requirement for a medical school, continued Sir Robert, was a wealth of clinical material, and unfortunately, Wales could only too easily supply that material. He believed that the demand for beds at the infirmary, (King Edward VII) was urgent and pathetic, there being constantly over

1,000 on the waiting-list. A large number of those cases was deprived of early admission, and so passed over the boundary line of hope, while at least a second thousand ran the risk of permanent neglect. No fewer than 1,500 beds were needed, not 400 as at present. Recently he had been invited by the infirmary staff to advise on the organization of orthopaedics, and he had laid it down as a fundamental principle and condition that no in-patient hospital for children should be tolerated in the centre of the city, and that the existing institution should only deal with out-patient clinics with the exception of a few beds for urgent cases. Long experience had taught him beyond question the injustice of segregating sick and deformed children in the vitiated air of a city hospital ward.

"The speaker referred to the great monument for all time in the Prince of Wales Hospital erected by Sir John Lynn-Thomas, and the possibilities of the expansion of the Glan-Ely Hospital for surgical tuberculosis."

Announcement

PRELIMINARY PROGRAMME OF THE ANNUAL MEETING OF THE AMERICAN ORTHOPAEDIC ASSOCIATION, TO BE HELD IN TORONTO, JUNE 7TH, 8TH, 9TH AND 10TH, 1920.

Monday, June 7th, Clinical Day.—This day will be spent at the Hospital for Sick Children and the Military Orthopaedic Hospital.

At the Hospital for Sick Children the programme will commence at 9 a. m. and will be arranged as follows:

1. Operations by the Staff illustrating the operative treatment of fractures and the fixation of tendons in infantile paralysis.
2. Presentation of Cases illustrating the late results of tendon fixation.
3. Presentation of Cases illustrating the results of the free transplantation of tendon and fascia.
4. Demonstration of the experimental method of studying the free transplantation of tendon and fascia.
5. Presentation of Cases illustrating the treatment of acute osteomyelitis.
6. Presentation of Cases illustrating the treatment of Pott's disease with heterogenous bone-grafts.
7. Presentation of unusual cases.

At the Military Orthopaedic Hospital the programme will commence at 2:30 p. m. and will be arranged as follows:

1. Operations by Professor Putti of Bologna, Italy; Lt. Colonel C. L. Starr, and Major D. E. Robertson. These operations will illustrate the method of cinematic amputation, the transplantation of tendons for irreparable nerve injuries, and the treatment of non-union of fractures.
2. Presentation of cases illustrating the results obtained from the suture of nerves.
3. Presentation of cases illustrating the results obtained from the transplantation of tendons for irreparable injuries to nerves.
4. Presentation of cases illustrating the results of the operative treatment of non-union in fractures.
5. Demonstration of the methods used by the Canadian Army in the treatment of amputation cases.
6. Presentation of interesting surgical cases which have resulted from war wounds.
7. Visit to the wards, gymnasium, curative workshop, artificial limb plant, etc.

Tuesday, Wednesday and Thursday, June 8th, 9th and 10th, in the Medical Building, University of Toronto, the following papers to be presented, the time to be stated later:

Professor Jacques Calve, France—Pott's Disease.
Professor Putti, Italy—Cinematic Amputation.
Mr. Naughton Dunn, Birmingham, England—Subject to be announced.
Mr. Robert Olleronshaw, F. R. C. S., Manchester, England—Cysts of the external semilunar cartilage of the knee-joint, etc.
Dr. Z. Adams—Codivilla's Operation for the Correction of Genu Valgum.
Dr. F. Albee—Certain Mechanical Features in the Treatment of Fractures in and about the Hip.
Dr. Nathaniel Allison—Bone Tuberculosis.
Dr. W. S. Baer—The Treatment of Osteoarthritis of the Hip-joint.
Dr. Wallace Blanchard—The Jones Operation for the Ankylosis of Subdeltoid Bursitis.
Dr. A. Mackenzie Forbes—The Operative Treatment of Scoliosis.
Dr. Albert H. Freiburg—Injuries in the Sesamoid Bones of the Great Toe.
Dr. Frederick J. Gaenslen and Dr. Wm. Thalhimer—A Lesion of the Trochanter and its Epiphysis, non-tuberculous.
Dr. Herbert Galloway—Open Operation for Congenital Dislocation of the Hip.
Dr. Roland Hammond—Pain in the Great Toe from Adhesions of the Sesamoid Bone.
Dr. R. I. Harris (by invitation)—An Operation for the Relief of Median Anesthesia.
Dr. F. C. Kidner—The Treatment of Osteomyelitis Resulting from Gunshot Wound.
Dr. Robert W. Lovett—The Operative Treatment of Infantile Paralysis.
Dr. H. Winnett Orr—Review of some of the Recent Text-book Teachings on the Treatment of Fractures of the Thigh and Leg.
Dr. Archer O'Reilly—Back-ache and Anatomical Variations of the Lumbo-Sacral Region.
Dr. F. E. Peckham—The Treatment of Certain Fractures.
Dr. Chas. J. Painter—Subject to be announced later.
Dr. Howard Prince—The Treatment of Old Fractures of the Os Calcis.
Dr. Edwin Ryerson—The Treatment of Osteomyelitis Resulting from Gunshot Wound.
Dr. Robert Soutter—Osteomyelitis of the Patella.
Dr. Jas. Warren Sever—Indications for and the Results of Astragalectomy in Infantile Paralysis.
Dr. Arthur Steindler—Congenital Malformation of the Hand.
Dr. Walter Stern—Chronic Circumscribed Osteomyelitis.
Dr. Walter Truslow—The Non-operative Treatment of Scoliosis.
Dr. Sidney A. Twinch—Preventive Orthopaedics.
Dr. Royal Whitman—Demonstration of the Results of Treatment of Fracture of the Neck of the Femur by the Abduction Method.
Candidates Theses.

On Tuesday evening the Association will be the guests of the Officer Commanding and the Officers of the Dominion Orthopaedic Hospital at a smoker to be given in the hospital.

On Wednesday evening the annual dinner will take place at Hart House. The regular meetings will be held in the Medical Building and luncheon will be served daily at Hart House.

The corrected programme will be in the hands of the members of the Association in the last week of May.

BRITISH ORTHOPAEDIC ASSOCIATION

SPECIAL MEETING JUNE 4TH & 5TH, 1920,
EDINBURGH

President: Sir Robert Jones, K. B. E., C. B.

PROGRAM

Friday, June 4th. In the Systematic Surgery Classroom, Edinburgh University

Morning Session

9:30 a. m. Executive proceedings.

10:00 a. m. Discussion on "The Principles of the correction of congenital talipes equino-varus and particularly of inveterate and relapsed cases." Opened by Mr. R. C. Elmslie.
"The results of tendon transplantation for paralysis of the muscles below the knee." Mr. John Fraser. (by invitation)
"Acute arthritis of the hips in infants." Mr. S. Irwin.
"Traumatic dislocation of the knee joint." Mr. Harry Platt.

1:00 p. m. Luncheon.

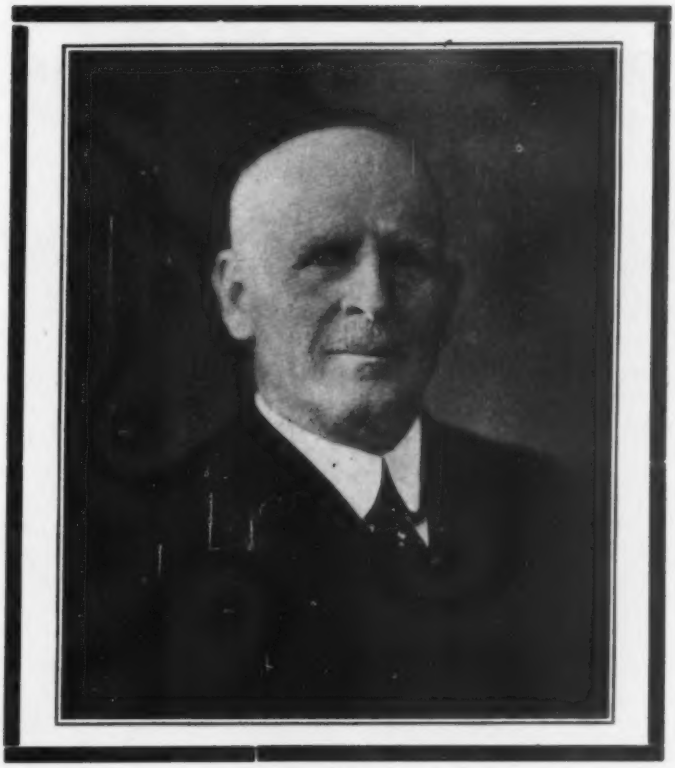
Afternoon Session

2:00 p. m. "The end results of arthroplasty of the knee joint." Professor V. Putti. (Bologna)
"Hallux Valgus, rigidus and malleus." Dr. Murk Jansen, of Leyden.
"The vital and mechanical factors in bone grafting." Mr. E. W. Hey Groves.
"Some notes on bone, fascia and tendon grafting." Mr. A. P. Mitchell. (by invitation)
"The possibilities of end to end suture after extensive nerve injuries." Miss Forrester-Brown. (by invitation)
Demonstration of cinematographic records illustrating the various types of gaits in children. Mr. John Fraser.

7:30 p. m. Association Dinner.

Saturday, June 5th. At the Edinburgh Royal Infirmary.

9:30 a. m. Operations and demonstrations of cases. Sir Harold Stiles.



DR. BERNARD BARTOW

Bernard Bartow was the fourth son of John and Katharine B. Bartow. He was born in Flint, Michigan, December 1, 1849. At the age of two years he came with his parents to Buffalo, where he spent the remainder of his life. He was the great-grandson of Mrs. Gamaliel St. John, noted in the history of Buffalo, as being the only person who saved her home in the burning of Buffalo during the war of 1812. Dr. Bartow was educated in the public schools of the city, and at the age of fifteen years, was made assistant to Mr. William Ives, librarian of the Young Men's Library, afterwards merged into the Buffalo Public Library. He graduated from the University of Buffalo in 1874, and was made an interne at the General Hospital immediately after graduation. Dr. Bartow was married by the Rev. Phillips Brooks June 26th, 1879 to Fanny F. Howes, daughter of Osborne Howes, Esq., a retired ship merchant of Boston.

Dr. Bartow started work as a surgeon, but possessing marked mechanical ability, his attention was directed to orthopedics, from the character of the cases referred to him. For a number of years he was the only man doing that special line of work in his part of the state.

Dr. Bartow was elected to the American Orthopedic Association in 1889.

At the time of his death he was: Orthopedic Surgeon in Chief, Children's Hospital. Consulting Orthopedic Surgeon, Buffalo General Hospital. Emeritus Professor of Orthopedic Surgery, Medical Dept., Univ. of Buffalo. Was a fellow of the American College of Surgeons, and local medical societies.

W. W. PLUMMER.

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Current Orthopaedic Literature

TREATMENT OF DENERVATED MUSCLE. By Frank A. Hartman, Ph. D., Professor of Physiology, University of Buffalo, Department of Medicine, Buffalo, N. Y., and W. E. Blatz, M. A., Toronto, Canada. *The Journal A. M. A.*, Vol. 74, No. 13, 3-27-20.

The generally accepted methods of treatment for denervated muscles are either massage or electrical stimulation. Until the investigations of Langley and his collaborators, no experimental work seriously questioned the value of massage or electrical treatment in a muscle whose nerves had been destroyed. Although Schiff, from observations that he had made on the tongue and the limb, concluded that fibrillation is a general phenomenon in muscle and nerve section, Langley was the first to suggest that the atrophy is due to continuous fibrillation. Fibrillation begins 4 or 5 days after nerve section, and persists until some of the regenerating fibers make connection with the muscle. Such incessant activity might well cause wasting of the muscle. Langley and Kato were able to check fibrillation by the intravenous injection of considerable amounts of calcium chloride. They demonstrated no change from the feeding of calcium lactate.

The authors have investigated the effects of massage on denervated muscles. Instead of depending entirely on the weight for comparison of the treated and untreated muscles, the work capacities were also determined. With the functional test as the method for comparison, the massaged muscles were found to be stronger in 62 per cent of the animals treated.

MASSAGE—The right limb of each animal was massaged for a certain period each day, varying from 2 to 20 minutes. Both right and left limbs were given passive movements three times at each treatment to aid in preventing stiffening of the joints. The feet were always encased in aluminum boots.

GALVANISM—A series of 24 animals were treated with the galvanic current. This treatment consisted of shocks produced by a metronome connected in the circuit, the aim being to secure a certain magnitude of contraction. This magnitude and duration of treatment varied in different rabbits. The contractions were roughly classified into minimal, moderate and vigorous. The duration varied from 5 to 15 minutes, but in many cases each alternate minute was allowed for rest. A greater voltage was required to produce the same magnitude of contraction as degeneration progressed.

Both the electrical and the massage series may be discussed together, for neither treatment appeared to produce any greater effect than the other. The treated limb on the whole did not appear to be any better off than the control limb.

Within the first month after denervation, there was a very marked drop in the power to respond to galvanic stimulation. This occurred alike in the two limbs.

In addition to the series in which the nerves were crushed or cut and immediately sutured, we have studied a series of 41 rabbits in which the proximal end of the nerve has not been permitted to unite with the distal end for periods varying from 30 to 100 days. These animals were treated either by massage or electricity. The treated muscles lost their galvanic response just as quickly as the controls. Moreover, neither message or electricity caused the denervated muscle to recover from the diminished response. Fourteen per cent of the rabbits did show a slight advantage on the treated side, but it was no more than would be expected from accidental variation.

Denervated muscle is not a muscle at rest. It is undergoing abnormal changes of which fibrillation is perhaps only one. Such changes are probably the cause of muscle atrophy, for Langley and Itagaki have shown that there is an increase in the rate of breakdown of the muscle substance.

The authors conclude from their present researches that massage in denervated muscle is futile. Galvanic treatment likewise appears to produce no beneficial effect.

The sciatic or tibial nerve was cut or crushed on both sides of 123 rabbits. The denervated muscles on the right side were either massaged, or else stimulated by galvanic shocks daily.

Union of the cut nerve was prevented in 41 animals, and in the others it was favored by suture or by crushing instead of cutting. The right and left muscle groups were compared every 10 to 14 days by a determination of their power to do work when stimulated by supermaximal galvanic shocks while the animals were under the influence of ether.

Neither massage or galvanic stimulation prevented the loss in galvanic response which normally develops a few days after denervation. Treatment likewise did not appear to cause a more rapid recovery of the muscle when the nerves were permitted to grow down to the muscle fibers. Galvanic response and voluntary function in the denervated muscle returned much earlier in crushed nerve cases than in cut and sutured cases.

In all their work the authors have been unable to demonstrate benefit from massage or galvanic stimulation.—*Leo C. Donnelly, Detroit.*

A Substitute for Open Operation in Some Irreducible Fractures. By J. Stanley Welch, M. D., Lincoln, Nebraska. *The Journal A. M. A.*, Vol. 74, No. 12, March 20. 1920.

Pursuant to the surgical principle of accomplishing most in the least radical manner, we have resorted to a simple method of reduction in several cases of fracture in which open operation seemed obligatory.

The mechanism of the reduction is a lever in the form of a small, strong steel probe acting between the displaced fragment ends and retained in situ by the plaster cast. It is resorted to under aseptic conditions with anaesthesia, while being observed under the fluoroscopic screen. The instrument is intro-

duced through the iodized skin on the side of the extremity most remote from large vessels. Its end is guided by watching in both axes under the fluoroscopic screen. It is carefully placed between the fragments in such a manner as best to pry them back into apposition. When they are reduced, the instrument may be withdrawn; or, in the event of a recurrence of displacement, it is surrounded with a small sterile dressing and the plaster splint is immediately applied. When this is firmly set, the protruding part of the instrument is cut off with a hack saw. No infection should occur, and in from seven to ten days the probe is removed with a pair of pliers without a change of the cast unless otherwise desired. No death of bone should occur in this time with the degree of pressure here necessary.

Occasionally one finds in a fracture of both bones of the forearm or leg an irreducible condition of one or both bones. It is a frequent experience to find that, once reduced, they do not so remain. This simple method will satisfactorily retain many such fractures and prevent a much more radical operation or a more cumbersome dressing in extension.—*Leo C. Donnelly, Detroit, Mich.*

OPERATIVE TREATMENT OF SPINAL TUBERCULOSIS. By John Fraser, F. R. C. S. *Edinburg Medical Journal*, January 20, 1920. New Series, XXIV, No. 1.

While the tendency has been to minimize the operative treatment of bone and joint tuberculosis in children, the operative treatment of spinal tuberculosis has increased in popularity. The two classes of operation have very different objects in view, for in the latter no attempt is made to eradicate the disease but to secure what may be called an internal splint of bone, and so to induce by fixation of the part a more efficient natural cure. The types of operation generally performed are those associated with the names of Albee and Hibbs.

Henderson, in the most recent paper on the subject reports 81 cases of Pott's disease. He claims a proportion of cures amounting to 43 per cent and in his series, there were no operation deaths.

The success of bone grafting for spinal tuberculosis has now become definitely established but there are certain details of the method which must be adhered to if ultimate success is to be gained. Alkalies and carbohydrates should be administered for some days previous to operation and chloroform should not be employed as the anaesthetic of choice. The precautions are necessary owing to the frequency of an acidosis in prolonged bone operations in case of children. With Albee's saw the time of operation can be greatly shortened and the shock reduced. Instead of the graft being placed between the split vertebal spines, it may advantageously be laid laterally along the sides of the spines. As the whole idea is to induce the formation of new periosteal bone and so secure efficient internal splintage, it is most important to separate the periosteum widely from the spines, laminae, articular and transverse processes. Only by so doing can a sufficiency of new periosteal bone be formed. A spine which has been efficiently treated should at the end of six months show an appearance as though a quantity of liquid wax had been formed over the posterior surface of the spine—so profuse should be the new bone formation.

Attention must be drawn to the danger of rough handling under the anaesthesia during the operation. The support of the erector-spinal muscles is gone and the spine may buckle or dislocate backwards if any unguarded movement is made.—*James R. Elliott, Kansas City, Missouri.*

REPORT OF PATIENT 6 YEARS AFTER THE TRANSPLANTATION OF A HOMOPLASTIC BONE GRAFT. By Henry Wade. *Edinburg Medical Journal*, January, 1920, New Series XXIV, No. 1.

CASE—August 12, 1913, W. W., age 27, admitted to Royal Infirmary, Edinburg, seven days before had fallen on right shoulder followed by numbness and inability to move shoulder. X-ray showed fracture of shaft of humerus running into the joint, thinning of the bone substance suggested pathologic fracture. Patient had had injury to the same shoulder two years previously, a fracture of the shaft through the level of insertion of the deltoid which healed promptly with some limitation of motion.

In August, 1913, patient was operated, the operative work that morning being so arranged that the case immediately preceeding was an amputation, middle of the thigh for senile gangrene, a portion of this femur was rapidly dissected out with all aseptic precautions leaving the internal condyle with its articular cartilage intact. Then the head of the humerus with six inches of the shaft was resected, leaving a cuff of one and one-half inches of the periostum projecting above the remaining portion of the humerus. The graft having been prepared in proper length was placed in situ and the muscles sutured over the graft with no further attempt to fix in position.

He remained in the hospital only four weeks and returned after another month. A short time later he resumed his work as a mill worker.

When examined in November, 1919, a firm mass of bone was felt occupying the position of the implanted graft. This new bone was firmly united to the shaft of the humerus. The patient could move the shoulder joint freely in all directions with some limitations, and free from pain except in extreme abduction. The deltoid was partially atrophied. X-ray showed the upper end of the humerus surrounded by a cuff of bone. The contour of the implanted graft was lost except for the upper end which had remained very much of the same appearance, the articular surface of the femoral condyle lying in contact with the glenoid cavity.

COMMENT—The result in this case was most satisfactory and had enabled the patient to continue his occupation for the last six years. The fate of the implanted graft evidently was not complete absorption in view of the appearance of the upper portion. The lost abduction probably could have been prevented by putting the arm up in extreme abduction instead of having it fixed at the patient's side.—*James R. Elliott, Kansas City, Missouri.*

To the Question of Spontaneous Fractures in the Hungerosteopathies of Adults. W. V. Simon. *Archiv f. Orthpaed. u. Unfalls-Chirurgie.* XVII. Bn. 3. Heft. Seite 364-378.

The author presents two cases of so-called spontaneous fractures in adults who have suffered from the peculiar disease of starvation which has in late years developed in central Europe as a result of undernourishment. Simon and other authors have named this bone condition: "starvation-osteopathy." From the cases quoted before in literature, these two vary in the localisation of the pathologic lesions. Instead of the common site, the upper end of the tibia and lower end of the femur, these cases have their lesions in the middle of the diaphysis of the tibia and the horizontal ramus of the pubis respectively. In neither case has trauma been the etiologic factor; it can however be assumed that weight bearing or static disturbance is the contributing cause of the fracture, which, if it found at all, is only the final result on the bone which has slowly and gradually undergone degeneration and destruction. The manner of production of this circumscribed bone lesion and the pathalogic anatomic substratum has so far remained undetermined. No autopsy has yet been available.

One of the cases may here be cited as an example:

Girl of 21, telephone operator, took sick one year ago with pain in the left ankle at first. Gradually the patient noticed a swelling of the left ankle which extended up to the middle of the tibia. The pain has extended to the middle of the tibia and is very severe when walking, while it disappears when resting.

Trauma, even of the mildest form, is entirely denied.

Findings: The patient is anaemic and undernourished. Oedema is present in both ankles, more on the left than the right side. At about the middle of the tibia one feels a circumscribed swelling which is painful and tender on pressure.

The spine shows a slight right dorsal-left lumbar scoliosis. Pressure on the sternum and the ilia is painful. Atrophy of the muscles is absent everywhere; motion in the joints is free, and the motor power nowhere reduced.

While standing the feet and hands are slightly cyanosed. Knee jerk increased, more on the left than the right side; achilles reflex present and exaggerated; otherwise nothing abnormal neurologically. Blood picture: Haemoglobin 75% R. c. 4,510,000. Leukoc: 8700 Eosinoph. Leukoc 3%, Neutroph. Leukoc 54%.

The urine negative to albumin and the Wasserman and v. Priquet are negative. The Xray, reproduced in the article, reminds one of the picture found in some persistent case of pseudoarthrosis which yield to neither conservative nor operative treatment.—*A. Gottlieb, San Francisco, Calif.*

INTERNAL DERANGEMENT OF THE KNEE. Gordon Watson. *Clinical Journal* October 1919.

The author points out that tears of a semilunar cartilage, according to experimental evidence, occur most easily during the final stage of extension, whereas clinical evidence shows it most likely to happen when the leg is partially flexed, abducted and rotated outwards. In about half the cases the tear is longitudinal and the longitudinal tear may involve the anterior part only, the whole cartilage, or the posterior portion. The external cartilage is affected in only 10 per cent of the cases.

The usual clinical history is of severe pain with locking followed by swelling. Sometimes a crack is heard at the time. Recurrence from trivial causes is common, and in the interval there is freedom from symptoms. The more chronic the condition, the less severe is the pain. The diagnosis depends largely on the history. In long-standing cases, relaxation of the internal lateral ligament and thickening of the synovial membrane may be detected. Nipping of the synovial fringes is distinguished by the symptoms being less marked and by a history of chronic disease. Locking from loose bodies may stimulate injury to a cartilage, but at some time or other these may be located in a superficial position; the diagnosis can be confirmed by roentgenogram.

Injury to the crucial ligaments and fracture of the tibial spine are always the result of severe violence. If the anterior crucial ligament is torn, while the posterior remains intact, the tibia in the extended position can be made to slide forward on the femur, while if the posterior is torn and the anterior intact, the tibia can be pushed backward on the femur without flexion.—*Thomson.*

THE THEZAC-PORSMEUR METHOD OF SUN TREATMENT. Robt. W. Lovett, M. D., Boston. *Jour. A. M. A.*, 1920. Vol. 74, No. 14.

The essential of the treatment is the concentration of the sun's rays by means of a double convex lens with a diameter of 12 inches and a focal length of 72 inches. At the focal point the heat is very great, as it would be in any lens used as a burning glass, and in general the patient should be placed at a point where the sun's rays form a circle of from 3 to 5 inches in diameter.

As the patient is moved farther away from the lens, the heat increases, and as the patient is moved nearer the lens, the heat diminishes. The degree of activity to which it is desirable to submit the wound can be regulated by carrying the lens nearer the patient or farther away.

The lens is mounted in a canvas cylinder, 1 foot in diameter and 3 feet in length, which is kept rigid by two circular wires with thin strips of wood running from one hoop to the other, over which the canvas is stretched. The lens is placed a few inches from one end of the cylinder. The advantage of this cylinder is that it enables the lens to be pointed directly at the patient and makes the application of the treatment more definite. The cylinder carrying

the lens is mounted on a tripod and can be swung in any direction by means of a handle.

The duration of the sun treatment should lengthen progressively. The first treatment should last for five minutes, and increase at the rate of about five minutes each day up to thirty minutes. In a certain case a longer period up to an hour and a half was used without apparent ill results. The skin around the wound was as a rule protected by towels, and the person giving the treatment wore colored glasses, as the light is extremely bright, and the eyes of the patient were protected if exposed to the glare of the circle of light. The patients were given one treatment a day.

The effect of the treatment on suppurating wounds were perfectly definite (1) The discharge immediately increased and then diminished; (2) pale granulations took on a healthier color, and (3) sensitiveness diminished. In order to test the efficacy of this treatment, a series of suppurating wounds of the severest type was selected, and cases that were obviously difficult. In the wards in a hospital for acute cases it was necessary to select a more acute type than would have been the case than in an institution for chronic diseases, as patients that were doing well were discharged to the convalescent home on account of the need of beds, and chiefly the chronic suppurations that were resistant remained long enough to be observed under this treatment.

There was greater progress in the cases treated by the lens than there had been before, or than there had been in similar cases. Improvement in Case L was striking. The boy had been a long time under observation, he had made no headway whatever, and from the time the lens treatment was begun his improvement was rapid and steady. In two acute osteomyelitis cases in which the treatment was used within a week after operation, it seemed to be too stimulating, the temperature rose, and the sun treatment had to be deferred.

For six years the author has had experience in sun treatment in which the whole body has been exposed, and he is a strong advocate of its value. The author is convinced that the treatment with the lens is a distinct addition to therapeutic measures. It can be delicately regulated and controlled; it is applicable when the sun is sufficiently clouded to be useless for general exposure; and it can be used in a sunny room by opening the window and pointing the cylinder at the sun. It seems free from risks when used according to directions, and it seems to embody real possibilities.

A bacterial count was made in all cases at short intervals, and a study of the cases shows that the effect of the sun treatment was to lower immediately the bacterial count in the discharge of the wound; but in several of these cases there was underlying suppuration, and the bacterial count was not affected.

The value of the treatment would seem to have been demonstrated in cases of chronic suppuration from tuberculosis, syphilis and chronic osteomyelitis.—*Leo C. Donnelly, Detroit.*

NEURO-MUSCULAR ATROPHY. Arthur Watkins, M. B., B. S. Griffith, Melbourne, South Wales. *Medical Journal of Australia*, 1920, 1:9, p. 189.

The case is that of a female twenty-one years of age, milliner by trade; had rheumatic fever three years ago, influenza in June, 1919. About four years ago her neck became very fat. In December, 1919, she noticed tingling and numbness in the toes, feet, and the legs from the knee down rapidly wasted. Within seven days from the onset a similar condition of the hands and fore arms was observed, wasting limited to the forearms downward. The hands resembled the griffon's claw. Fibrillary contractions were present in the atrophied muscles, and vaso-motor changes were apparent. A marked deposit of sub-cutaneous fat existed from the nape of the neck to the first dorsal vertebra.

The fat disappeared after one week of thyroid gland therapy, consisting of 0.3 grammes daily.—*Thomson.*